UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/696,956	10/27/2000	Daniel E. Fisher	001.00001	3189

7590 10/28/2005

Daniel E Fisher
40452 Hickory Ridge Place
Aldie, VA 20105

EXAMINER	
CHOW, CHARLES CHIANG	
ART UNIT	**PAPER NUMBER**
2685	

DATE MAILED: 10/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/696,956	FISHER, DANIEL E.	
	Examiner	Art Unit	
	Charles Chow	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3-8,18 and 19* is/are allowed.

6)☒ Claim(s) *1,2,9-12,14-17 and 20-23* is/are rejected.

7)☒ Claim(s) *13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action
(Amendment Received on 9/19/2005)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-2, 22, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson (US 3,816,834) in view of Morita (US 5,355,767).

Regarding **claim 1**, Wilson teaches a receiver [receiver in Fig. 2 for radio interferometer system ,abstract] comprising an RF bridge coupled to receive a reference signal [the rf bridge in Fig. 2 having two antennas 4, 5, three converters, 6, 14, 12 and the reference signal from oscillator 8 coupled to first mixer 6, and reference signal from voltage controlled oscillator 16 is coupled to a second mixer 14],

the rf bridge including first and second frequency converters [first mixer converter 6, second mixer converter 14] coupled to respective first and second antennas [antennas 4, 5]; and

a third frequency converter coupled to outputs of the first and second frequency converters [the third frequency converter 12 coupled to the outputs of mixers 6, 14, Fig. 2].

Wilson fails to teach a processor coupled to the rf bridge. However, Morita teaches a controller 56 coupled to the mixer 44, 46 for controlling the frequency of VCO 48 [Fig. 3, col. 5, lines 46-62], a receiver in shell 12 for measuring angle and range of a emission target source 14 [abstract, col. 5, lines 1-62], in order to improve the

measurement accuracy by adjusting the oscillator frequency to the first and second mixers. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson with Morita's processor coupled to the oscillator, a pair of mixers, in order to improve the measurement accuracy, by adjusting of the oscillator frequency.

Regarding **claim 2**, Wilson teaches the first and second frequency conveters [mixer 6, 14] which receives respective first and second signals from the respective first and second antennas [4,5];

and the third frequency converter [12] heterodynes signals from the first and second frequency converters to provide a signal that is characterized by a frequency difference modulated onto the reference signal [the third converter mixer 12 provide the frequency difference signal modulated onto the a reference signal Φ4 having 1 MHz, col. 2, lines 45-65, Fig. 2].

Regarding **claim 22,** Wilson teaches a method comprising capturing a frequency difference that is present at first and second antennas [the captured frequency difference of antenna signal Φ1 at antenna 4, Φ2 at antenna 5, col. 2, lines 59-65], producing an information signal onto which the frequency difference has been modulated [the frequency difference at the output of mixer 12 is modulated onto 1 MHz, Fig. 2], analyzing the information signal to determine the frequency difference [the phasor 24 analyzes frequency different Φ1-Φ2-Φ4, to provide angle information based on Φ=f(cos p), Fig. 7, col. 2, lines 55-66].

Wilson fails to teach the determining a range. However, Morita teaches the determining a range from the information signal based on the frequency [the bearing rate β-dot in equation in col. 6, line 21, for the frequency changes; the determining of the range from a vehicle to the target emitter, col. 6, lines 14-32; range different

from emitter source to two antenna element, col. 6, lines 56-66], in order to improve the measurement accuracy by adjusting the oscillator frequency to the first and second mixers. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson with Morita's processor coupled to the oscillator, a pair of mixers, in order to improve the measurement accuracy, by adjusting of the oscillator frequency.

Regarding **claim 24**, Wilson teaches the reference signal 1MHz, Φ4, from 14, is only coupled to mixer 14, the Φ3+Φ4 input to mixer 14 in Fig. 2].

2. Claims 9, 14-15, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson (US 3,816,834) in view of Murphy et al. (US 5,541,608).

Regarding **claim 9**, Wilson teaches a receiver comprising an rf bridge [the rf bridge in Fig. 2 having two antennas 4,5, three converters, 6, 14, 12], the reference signal being coupled to the rf bridge [the reference signal from oscillator 8 coupled to first mixer 6], and reference signal from voltage controlled oscillator 16 is coupled to a second mixer 14].

Wilson fails to teach a processor coupled to the rf bridge to receive an information signal from the rf bridge, a digital frequency source to generate a reference signal based on a signal from a clock source. However, Murphy et al. (Murphy) teaches the microprocessor 68 coupled to the rf bridge via digital control 66 [antennas 30, a pair of mixers 55, freq. discriminator 59, phase compare 63 in Fig. 7], the microprocessor controls the local synthesizer oscillator 58 for performing the angle measurement [abstract, col. 8, lines 5-27], based on the obvious reference clock source in the synthesizer 68, a synthesizer is obviously comprising a reference clock source for generating oscillator output signal. Therefore, it would have been obvious to one of

ordinary skill in the art at the time of invention to modify Wilson with Murphy's reference clock source in the synthesizer controlled by microprocessor 68, in order to control the oscillator frequency sent to a pair of frequency converters.

Regarding **claim 14**, Wilson teaches the rf bridge [Fig. 2] include first and second rf frequency converters [6, 14] coupled to respective first and second antennas (antennas 4, 5]; and a third rf frequency converter [12] coupled to output of the first and second rf frequency converters [third mixer 12 coupled to the output of mixer 6, 14 via amplifier 10, 20].

Regarding **claim 15**, Wilson teaches the first and second frequency converters [6, 14] receive respective first and second signals from the respective first and second antennas [4, 5], the third frequency converter [12] heterodynes signals from the first and second frequency converters, to provide a signal that is characterized by a frequency difference modulated onto the reference signal [the output of mixer 12 provides the modulated frequency difference at 1 MHz], the frequency difference being a difference between a frequency of the first signal and a frequency of the second signal [the frequency different being the difference of antenna signal Φ1 at antenna 4, Φ2 at antenna 5, col. 2, lines 59-65].

Regarding **claim 21**, Wilson teaches a receiver [Fig. 2] comprising an rf bridge that includes plurality frequency converters [three mixers 6, 14,12] and two antennas [4, 5], the rf bridge providing an information signal, that is characterized by a frequency equal to the reference frequency modulated by a frequency reference [the output of mixer 12 provides the modulated frequency difference at 1 MHz],

the frequency difference being a difference between a frequency of a signal received at one of the two antennas and a frequency of a signal received at another

of the two antenna [the frequency different being the difference of antenna signal Φ1 at antenna 4, Φ2 at antenna 5, col. 2, lines 59-65].

Wilson fails to teach an information signal to the processor. Murphy teaches the microprocessor 68 received the fmeas from frequency discriminator 59 of the rf bridge, via the digital control circuit 66, Fig. 7, col. 8, lines 51-60], for locating the closet measurement for computing angle [col. 8, line63-67]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson with Murphy's fmeas to processor 68, in order to a accurate angle.

3. Claims 10-11, are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of Murphy as applied to claim 9 above, and further in view of DesJardins (US 5,570,099).

Regarding **claim 10**, Wilson and Murphy fail to teaches the circuitry to detect includes a first fourier transformer having a first frequency and a second fourier transformer having a second center frequency, the first center frequency being different than the second center frequency. However, DesJardins teaches these features, the first, second, fourier transforms 18, 34, for respective first, second, center frequency associated with the different center frequencies of each Filters 20, 36, for determining of the transmitter location from two antenna signals (abstract, Fig. 1-3, col. 3, lines 35-59, col. 2, line 65 to col. 3, line 25', col. 5, lines 37-45). DesJardins teaches the measuring, calculating, of the range, and the difference in range AR, the frequency difference of arrival (col. 1, lines 3-43), with accuracy to minimize error (col. 3, lines 17-31) for locating a transmitter. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson, Murphy with DesJardins accurate digital processing Hilbert transforms, Fm

filter for two receiving path, such that the calculated frequency difference, range, information could be accurate.

Regarding **claim 11**, DesJardins teaches the circuitry to detect includes a digital frequency generator (analog to digital converters 16, 32), that generates a first digital at the first center frequency coupled to the first fourier transform, and a second digital signal at the second center frequency coupled to the second fourier transform [the Hilbert transforms 18, 34, coupled to the respective A/D converter 16, 32 with first center frequency for Fm filter 20, and second center frequency for FIR filter 36, abstract, Fig. 1-3, col. 3, lines 35-59, col. the detecting of angular discrimination of targets by airborne radar (abstract; Fig. 1-3,. col. 1, line 1 1 to col. 24].

4. Claim 12 is rejected under 35 U.S.C. 103 of Wilson in view of Murphy, DesJardins, as applied to claim 10 above, and further in view of Maitre et al. (US 4,903,030).

Regarding claim 12, DesJardins teaches Hilbert transform 18, 34, but DesJardins , Wilson, Murphy fail to teach the frequency discriminator coupled to the fourier transform. However, Maitre 27 (Fig. 1) is coupled to the frequency analysis 26 (Fig. 1) for the detecting of angular discrimination of targets by airborne radar (abstract, Fig. 1-3, col. 1, line 11 to col. 24, line 5). Maitre teaches the Doppler frequency can be selected with extreme precision for the very fine angular discrimination (col. 1, lines 41-45), in order to finely measure the angle associated with a target. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson, Murphy, DesJardins, with Maitre's frequency analysis in descriminator, in order to accurately determined the angle information.

5. Claims 17, 20, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of DesJardins (US 5,570,099).

Regarding **claim 17,** Wilson teaches a method comprising capturing a frequency difference that is present at first and second antennas [the captured frequency difference of antenna signal Φ1 at antenna 4, Φ2 at antenna 5, col. 2, lines 59-65], producing an information signal onto which the frequency difference has been modulated [the frequency difference at the output of mixer 12 is modulated onto 1 MHz, Fig. 2].

Wilson fails to teach the first and second fourier transform. However, DesJardins the step of analyzing (Fig. 3) include forming a first fourier transform (Hilbert transform 18) of the information signal at a first center frequency (center frequency used by FIR filter 20), forming a second fourier transform (Hilbert transform 34) of the information signal at a second center frequency (center frequency used by FIR filter 36), the second center frequency being different than the first frequency (the center frequency for FIR filters 20 is for frequency of receiver 10 which is different from center frequency of FIR filter 36 which is for frequency of receiver 12), in order to increase the measurement accuracy to minimize error (col. 3, lines 17-31) for locating a transmitter. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wilson with DesJardins' accurate digital processing Hilbert transforms, Fm filter for two receiving path, such that the calculated frequency difference, range, information could be accurate.

Regarding **claim 20**, DesJardins teaches a step of determining a range between a emitter generating the signal and a point between the first and second antennas [the step to determine the range R1, R2, based on the signals from two antennas in equation v=f * (R1-R2)/c in col. 1, lines 9-27, v is the frequency difference]

Regarding **claim 23**, DesJardins teaches the determining a range based on the outputs of the first and second fourier transforms [the first and second Hilbert fourier transforms 18, 34; the range R1, R2, in following equation associated with the frequency difference v=f* (R1-R2)/c in col. 1, lines 9-27; the correcting frequency difference v in col. 5, lines 11-45; the determining cf the accurate value of frequency difference v in col. 6, lines 51-62].

Claims Objection

6. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art fails to teach the structure in claim 13, and the equation for frequency difference in claim 19.

Claims allowable

7. Claims 3-8, 18-19 are allowable over the prior art of record. (in last office action also). The following is the examiner's statement for the reasons of allowance:
Claims 3-8, 18-19 are allowable over the prior art of record, the prior art fails to teach singly, particularly, or in combination, the subject matter, for the structures in claims 3, 5, 6, and the **wherein the integration interval is inversely proportional to a difference between the first center frequency and the second frequency** in claim 18. The dependent claims are also allowable due to their dependency upon the independent claims and having further claimed features.
The closest prior art to **Johnson (Us 4,245,220**) teaches the first, second, third frequency converters having two antennas for calculating the frequency difference to determining the target location (abstract, frequency different $\Delta f \times (t/T)$ in col. 2, lines 7-16; the analyzing using processor for the signals from filter bank; col. 2, lines 54-600; the frequency difference in col. 3, lines 55-60; Δf in col. 2, line 61 to col. 3, line

65). Johnson fails to teach the structures in claims 3, 5-6, and the where the integration inverval is inversely proportional to a difference between the first center frequency and the second frequency.

Other prior arts are considered but they fail to teach the above claimed features in claim 3-8, 18-19.

Stone (US 3,680,124) teaches the determining of the azimuth information from the signal difference from antennas A1-A2. Stone teaches the third frequency converter 71 coupled to the first, second frequency converter 65/67. Stone fails to teach the fourth frequency converter, the additional up converter/down converter coupled to the rf bridge and processor, having first, second fourier transform center frequency.

Cash (US 4,509,052) teaches the reinteferometer/Dopper target location system (abstract, 1-6), frequency converters 10/12, for measuring elevation angle, azimuth angle and range (abstract, summary of invention, his claims 1, 10), the processor 34 to analyzer frequency difference according to equations (col. 7, lines 3-24).

DesJardins (US 5,570,099) teaches the accurate range and frequency calculation FDOA, using digital signal processing, Hilbert transforms, FIR filters, to analyzing two antenna received signals, to locating a transmitter (abstract, Fig. 1-3, col. 3, liens 35-59; col. 2, line 65 to col. 3, line 25; col. 5, lines 37-45; col. 3, lines 17-31).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Argument

8. Applicant's arguments with respect to claims 1-2, 9-12, 14-17 20-23 have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicant's argument for Johnson's sonar system with active transmitter which is in different field of applicant and it is not a qualified reference; reference Kitayama is in AFC which is different from applicant's field of application, the angle rate interferometer and range, the ground of rejection has been changed to **Wilson (US 3,816,834) and Morita (US 5,355,767)**.

Wilson et al. (Wilson) teaches radio interferometer [abstract, Fig. 2] having reference signal 8, 16 coupled to the first and second mixer 6, 14 and a third mixer 12 coupled to the outputs of the first and second mixers 6, 14.

Morita teaches a controller 56 coupled to the mixer 44, 46 for controlling the frequency of VCO 48 [Fig. 3, col. 5, lines 46-62], a receiver in shell 12 for measuring angle and range of a emission target source 14 [abstract, col. 5, lines 1-62].

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles C. Chow whose telephone number is (571) 272-7889. The examiner can normally be reached on 8:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (571) 272-7899. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charles Chow C.C.

October 1, 2005.

EDWARD F. URBAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600